What is claimed is:

1. A reactor structural member comprising:

a surface adapted to be located in a reactor water of a nuclear reactor; and

a corrosion potential reducing substance provided on the surface, the corrosion potential reducing substance being selected from the group consisting of a photocatalytic substance which produces an electromotive force under an irradiation of a light or a radioactive ray in the nuclear reactor and a metal or a metal compound which forms the photocatalytic substance under a condition specified by a temperature and a pressure in the nuclear reactor.

2. The reactor structural member according to claim 1, wherein the corrosion potential reducing substance is formed as a particle having a surface on which at least one of Pt, Rh, Ru and Pd is provided.

3. The reactor structural member according to claim 1, wherein the light in the nuclear reactor is a Cherenkov ray produced in a water-cooled nuclear reactor.

4. The reactor structural member according to claim 1, wherein the photocatalytic substance has a property of an n-type semiconductor.

5. The reactor structural member according to claim 1, wherein the corrosion potential reducing substance is made to adhere to or to form a film on the surface of the reactor structural member.

6. The reactor structural member according to claim 1, wherein a mass or a thickness of the corrosion potential reducing substance is designed so that a current produced by the photocatalytic substance under the irradiation of the light or the radioactive ray is not lower than a sum of threshold current densities of an oxygen and a hydrogen peroxide contained in the reactor water.

7. The reactor structural member according to claim 1, wherein the photocatalytic substance is one or more compound selected from the group consisting of TiO_2, ZrO_2, PbO, $BaTiO_3$, Bi_2O_3, ZnO, WO_3, $SrTiO_3$, Fe_2O_3, $FeTiO_3$, $KTaO_3$, $MnTiO_3$

and SnO_2.

8. The reactor structural member according to claim 1, wherein the corrosion potential reducing substance is an oxide of Ti or Zr, metal Ti, metal Zr, or a hydrate of Ti or Zr.

9. The reactor structural member according to claim 1, wherein an adhesiveness of the corrosion potential reducing substance to a corrosion oxide film formed on the surface of the reactor structural member is enhanced by providing a hydrophilic property or by mixing a binder substance.

10. A method of suppressing a corrosion of a reactor structural member, comprising:

controlling a corrosion potential of the reactor structural member by providing a corrosion potential reducing substance on a surface of the reactor structural member, the corrosion potential reducing substance being selected from the group consisting of a photocatalytic substance which produces an electromotive force under an irradiation of a light or a radioactive ray in the nuclear reactor and a metal or a metal compound which forms the photocatalytic substance under a condition specified by a temperature and a pressure in the nuclear reactor.

11. The method according to claim 10, wherein the corrosion potential reducing substance is formed as a particle having a surface on which at least one of Pt, Rh, Ru and Pd is provided.

12. The method according to claim 10, wherein an iron concentration of a feedwater in the nuclear reactor is controlled.

13. The method according to claim 10, wherein the photocatalytic substance is one or more compound selected from the group consisting of TiO_2, ZrO_2, PbO, $BaTiO_3$, Bi_2O_3, ZnO, WO_3, $SrTiO_3$, Fe_2O_3, $FeTiO_3$, $KTaO_3$, $MnTiO_3$ and SnO_2.

14. The method according to claim 10, wherein the corrosion potential reducing substance is made to adhere to or to form a film on the surface of the reactor structural

member.

15. The method according to claim 10, wherein a solution or a suspension of a composition containing the photocatalytic substance is added to a reactor water so as to make the photocatalytic substance adhere to the surface of the reactor structural member or to form a film of the photocatalytic substance on the surface of the reactor structural member.

16. The method according to claim 10, wherein the corrosion potential reducing substance is made to adhere to or is deposited on the surface of the reactor structural member by spraying, thermal spraying, physical vapor deposition or chemical vapor deposition.

17. The method according to claim 10, wherein the corrosion potential reducing substance is formed as a film having a thickness in a range of 0.1 to 1 μm.

18. The method according to claim 10, wherein the reactor structural member is made of an iron-base or nickel-base alloy, the corrosion potential reducing substance is formed on a corrosion oxide film formed on the surface of the reactor structural member.

19. The method according to claim 18, wherein the corrosion oxide film has an outer layer having a property of an n-type semiconductor and an inner layer having a property of a p-type semiconductor, or has a single layer having a property of a p-type semiconductor.

20. The method according to claim 19, wherein, when the corrosion oxide film has the outer layer having a property of an n-type semiconductor and the inner layer having a property of a p-type semiconductor, the corrosion potential reducing substance is formed on the corrosion oxide film of the reactor structural member after making the outer layer unstable by increasing a hydrogen concentration of the reactor water or after removing the outer layer by a decontamination process.

21. The method according to claim 20, wherein the outer layer having a property of an n-type semiconductor is removed

by a chemical decontamination process, an electrolytic decontamination process or a laser decontamination process.

22. The method according to claim 21, wherein the outer layer having a property of an n-type semiconductor is removed by irradiating the outer layer with a laser light in a water.

23. The method according to claim 10, wherein a loose deposition of a hematite on a surface of a nuclear fuel is suppressed by controlling an iron concentration of a feedwater in the nuclear reactor by a purifier placed in a condensing system of the nuclear reactor.

24. The method according to claim 23, wherein the purifier includes a filter device and a demineralizer device.

25. The method according to claim 10, wherein a hydrogen or a methanol is injected through a feedwater system of the nuclear reactor into a reactor water.

26. A method of suppressing a corrosion of a reactor structural member, comprising:

controlling an iron concentration of a feedwater in the nuclear reactor so that a hematite in a loose deposition is not produced on a surface of a nuclear fuel;

depositing at least one of Pt, Rh, Ru and Pd on a corrosion oxide film formed on a surface of the reactor structural member in a mass per unit area of 0.1 $\mu g/cm^2$; and

controlling a quality of a reactor water so that the reactor water has an oxygen/hydrogen molar ratio in a range of 0.4 to 0.5.